UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

1444 7590 02/01/2007

BROWDY AND NEIMARK, P.L.L.C.
624 NINTH STREET, NW
SUITE 300
WASHINGTON, DC 20001-5303

EXAMINER	
COOLEY, CHARLES E	
ART UNIT	PAPER NUMBER
1723	

DATE MAILED: 02/01/2007

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/507,104	08/12/2005	Erland Gronnegaard	GRONNEGAARD1	2100

TITLE OF INVENTION: DECANTER CENTRIFUGE WITH WEAR REINFORCEMENT INLET

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	$1400	$300	$0	$1700	05/01/2007

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the SMALL ENTITY status shown above.

If the SMALL ENTITY is shown as YES, verify your current SMALL ENTITY status:

A. If the status is the same, pay the TOTAL FEE(S) DUE shown above.

B. If the status above is to be removed, check box 5b on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and twice the amount of the ISSUE FEE shown above, or

If the SMALL ENTITY is shown as NO:

A. Pay TOTAL FEE(S) DUE shown above, or

B. If applicant claimed SMALL ENTITY status before, or is now claiming SMALL ENTITY status, check box 5a on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and 1/2 the ISSUE FEE shown above.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

1444 7590 02/01/2007

BROWDY AND NEIMARK, P.L.L.C.
624 NINTH STREET, NW
SUITE 300
WASHINGTON, DC 20001-5303

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)

(Signature)

(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/507,104	08/12/2005	Erland Gronnegaard	GRONNEGAARD1	2100

TITLE OF INVENTION: DECANTER CENTRIFUGE WITH WEAR REINFORCEMENT INLET

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	$1400	$300	$0	$1700	05/01/2007

EXAMINER	ART UNIT	CLASS-SUBCLASS
COOLEY, CHARLES E	1723	494-053000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).
   - ☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
   - ☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
   (1) the names of up to 3 registered patent attorneys or agents OR, alternatively,
   (2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.
   1 _____
   2 _____
   3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:
- ☐ Issue Fee
- ☐ Publication Fee (No small entity discount permitted)
- ☐ Advance Order - # of Copies _____

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**
- ☐ A check is enclosed.
- ☐ Payment by credit card. Form PTO-2038 is attached.
- ☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)
- ☐ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27.
- ☐ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

UNITED STATES PATENT AND TRADEMARK OFFICE

FEB 05 2007

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/507,104	08/12/2005	Erland Gronnegaard	GRONNEGAARD1	2100

1444 7590 02/01/2007

BROWDY AND NEIMARK, P.L.L.C.
624 NINTH STREET, NW
SUITE 300
WASHINGTON, DC 20001-5303

EXAMINER	
COOLEY, CHARLES E	
ART UNIT	PAPER NUMBER
1723	

DATE MAILED: 02/01/2007

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment to date is 112 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 112 day(s).

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

PTOL-85 (Rev. 07/06) Approved for use through 04/30/2007.

Notice of Allowability	Application No.	Applicant(s)	
	10/507,104	GRONNEGAARD ET AL.	
	Examiner	Art Unit	
	Charles E. Cooley	1723	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *the application as filed*.

2. ☒ The allowed claim(s) is/are *1-12*.

3. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☒ All b) ☐ Some* c) ☐ None of the:
      1. ☐ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☒ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
   (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☒ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date 20040910
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
7. ☐ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

EXAMINER'S REMARKS

1. The following is an Examiner's Statement of Reasons for Allowance:

The prior art of record shows wear reinforcement members for decanter centrifuges but does not teach or fairly suggest the recited configuration of the wear reinforcement member and cooperation with the inlet chamber as set forth in claim 1.

2. Any comments considered necessary by applicant must be submitted no later than the payment of the Issue Fee and, to avoid processing delays, should preferably **accompany** the Issue Fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

3. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Charles E. Cooley whose telephone number is (571) 272-1139. The examiner can normally be reached on Mon-Fri. The examiner's supervisor, Wanda Walker can be reached on (571) 272-1151. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Charles E. Cooley
Primary Examiner
Art Unit 1723

19 January 2007

PTO/SB/08a (08-03)
Approved for use through 07/31/2006. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449A/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(use as many sheets as necessary)

Sheet 1 of 1

Complete if Known	
Application Number	PCT/DK03/00068 10/507104
Filing Date	September -, 2004
First Named Inventor	GRONNEGAARD, Erland
Group Art Unit	1723
Examiner Name	
Attorney Docket Number	GRONNEGAARD1

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
CEC	AA	US-3,428,246A	02-18-1969	Finkelston	
		US-			
		US-			
		US-			
		US-			
		US-			
		US-			
		US-			
		US-			
		US-			
		US-			
		US-			
		US-			
		US-			
		US-			
		US-			
		US-			

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Number Country Code[3] Number[4] Kind Code[5] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]
CEC	AB	DE-4041868A1	02-07-1992	KLOCKNER-HUMBOLDT-DEUTZ AG		
CEC	AC	DE-3723864A1	01-26-1989	WESTFALIA SEPARATOR AG		
CEC	AD	DE-1815199A	07-24-1969	PENNSALT CHEMICALS CORP		

Examiner Signature	/Charles E. Cooley/	Date Considered	01/19/2007

* EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. [1] Applicant's unique citation designation number (optional). [2] See Kind Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

Notice of References Cited	Application/Control No. 10/507,104	Applicant(s)/Patent Under Reexamination GRONNEGAARD ET AL.	
	Examiner Charles E. Cooley	Art Unit 1723	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-3,148,145 A	09-1964	REED KARL G	494/53
*	B	US-3,568,919 A	03-1971	Nielsen, Torben Boss	494/53
*	C	US-3,568,920 A	03-1971	Nielsen, Torben Boss	494/53
*	D	US-4,142,669 A	03-1979	Burlet, Gerard	494/53
*	E	US-5,244,584 A	09-1993	Schlieperskoetter, Bernd	210/787
*	F	US-5,259,828 A	11-1993	Schlieperskoetter, Bernd	494/38
*	G	US-5,380,434 A	01-1995	Paschedag, Thomas B.	210/360.2
*	H	US-5,401,423 A	03-1995	Leung et al.	210/787
*	I	US-2006/0025297 A1	02-2006	Gronnegaard et al.	494/053
*	J	US-7,060,019 B2	06-2006	Hermeler et al.	494/53
*	K	US-2006/0240966 A1	10-2006	Lantz, Edward Carl	494/054
*	L	US-2006/0166803	07-2006	Schulz et al.	494/056
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N	DE 4041868 A1	07-1992	Germany	VIERTEL et al.	B04B 01/20
	O	JP 11267549 A	10-1999	Japan	TABATA et al.	B04B 11/02
	P	WO 3076078 A1	09-2003	World Intellect	GROENNEGAARD et al.	B04B 01/20
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

(19) BUNDESREPUBLIK DEUTSCHLAND

DEUTSCHES PATENTAMT

(12) **Offenlegungsschrift**

(10) **DE 40 41 868 A 1**

(51) Int. Cl.[5]:
B 04 B 1/20
B 04 B 7/12

(21) Aktenzeichen: P 40 41 868.5
(22) Anmeldetag: 27. 12. 90
(43) Offenlegungstag: 2. 7. 92

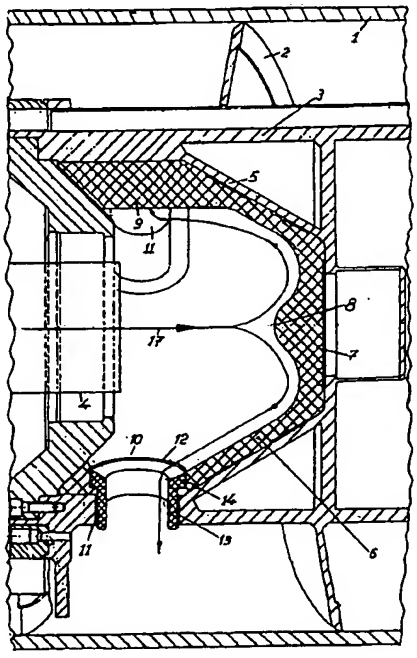
DE 40 41 868 A 1

(71) Anmelder:
Klöckner-Humboldt-Deutz AG, 5000 Köln, DE

(72) Erfinder:
Viertel, Rudolf, 5064 Rösrath, DE; Feldkamp, Bernward, 4230 Wesel, DE

(54) Zentrifuge

(57) Bisher hat man bei Zentrifugen, insbesondere Vollmantel-Schneckenzentrifugen mit axialem Schlammzuführungsrohr, das in eine mit Schlammdurchtrittsöffnungen und Verschleißeinsatz versehene Einlaufkammer der Zentrifuge mündet, Ausflußbuchsen von außen in die Schlammdurchtrittsöffnungen eingeführt und diese mit Schrauben oder dergleichen an der Einlaufkammer befestigt. Demgegenüber sind bei der erfindungsgemäßen Zentrifuge die Schlammdurchtrittsöffnungen (11) der Einlaufkammer (5) mit verschleißfesten Ausflußbuchsen (13) versehen, die von innen in die Schlammdurchtrittsöffnungen (11) der Einlaufkammer (5) fest und völlig abdichtend, aber auswechselbar eingesetzt sind. Hierdurch wird nicht nur sehr vorteilhaft das Auswechseln der Ausflußbuchsen erheblich vereinfacht, sondern es werden auch durch die entsprechende Ausbildung der Einlaufkammer Feststoffansätze innerhalb der Einlaufkammer der Zentrifuge mit Sicherheit vermieden.



DE 40 41 868 A 1

Beschreibung

Die Erfindung bezieht sich auf eine Zentrifuge, insbesondere Vollmantel-Schneckenzentrifuge mit axialem Schlammzuführungsrohr, das in eine mit Schlammdurchtrittsöffnungen und Verschleißeinsatz versehene Einlaufkammer der Zentrifuge mündet.

Die Zuführung des zu trennenden Feststoff-Flüssigkeitsgemisches bzw. Schlammes in die Zentrifuge erfolgt im allgemeinen durch ein in der Zentrifuge axial verlaufendes Rohr, das in eine mit Schlammdurchtrittsöffnungen und Verschleißeinsatz versehene Einlaufkammer mündet. Bei Vollmantel-Schneckenzentrifugen ist sowohl das Schlammzuführungsrohr als auch die Einlaufkammer für die Zuführung des zu trennenden Feststoff-Flüssigkeitsgemisches in die Zentrifugentrommel in der Schneckenhohlwelle angeordnet. Sowohl die Einlaufkammer als auch die Schlammdurchtrittsöffnungen in der Einlaufkammer hat man bisher innen mit verschleißfesten Materialien ausgekleidet, um dadurch die Standzeit dieser Bauteile, die im Betrieb der Zentrifuge einem erhöhten Verschleiß ausgesetzt sind, wesentlich zu erhöhen. Die Schlammdurchtrittsöffnungen der Einlaufkammer wurden hierbei mit Ausflußbuchsen versehen, die von außen in die Schlammdurchtrittsöffnungen der Einlaufkammer eingesetzt und mit Hilfe von Schrauben fest mit der Einlaufkammer verbunden wurden, wobei aber eine Abdichtung zwischen den Ausflußbuchsen und dem Verschleißeinsatz der Einlaufkammer schwierig zu bewerkstelligen war. Nicht nur die Montage und Demontage dieser Ausflußbuchsen an der Einlaufkammer ist mit einem erhöhten Arbeits-, Zeit- und Kostenaufwand verbunden, sondern es besteht hierbei auch die Gefahr, daß es durch Lösen von Schrauben oder durch einseitige Feststoffablagerungen im Bereich der Schlammdurchtrittsöffnungen zu Unwuchtbildungen kommt, die nicht nur den Betrieb der Zentrifuge beeinträchtigen, sondern die auch zu unnötigen Betriebsunterbrechungen führen.

Die Aufgabe der Erfindung besteht darin, diese Nachteile zu vermeiden.

Diese Aufgabe wird dadurch gelöst, daß die Schlammdurchtrittsöffnungen der Einlaufkammer mit verschleißfesten Ausflußbuchsen versehen sind, die von innen in die Schlammdurchtrittsöffnungen der Einlaufkammer fest, aber auswechselbar eingesetzt sind. Durch diese Maßnahmen können sehr vorteilhaft besondere Befestigungsmittel wie Schrauben oder dergleichen fortfallen, und das Einsetzen der Ausflußbuchsen in die Schlammdurchtrittsöffnungen der Einlaufkammer von innen kann so vorgenommen werden, daß der Schlamm aus der Einlaufkammer über die Schlammdurchtrittsöffnungen völlig störungsfrei austreten kann und dadurch jegliche Feststoffablagerungen in der Einlaufkammer mit Sicherheit vermieden werden. Auch der Einbau der Ausflußbuchsen in die Schlammdurchtrittsöffnungen der Einlaufkammer sowie das Auswechseln von verschlissenen Ausflußbuchsen wird dadurch, daß die Ausflußbuchsen von innen in die Schlammdurchtrittsöffnungen der Einlaufkammer eingesetzt sind, ganz erheblich vereinfacht und erleichert, da die Ausflußbuchsen bei der Montage lediglich von innen in die Schlammdurchtrittsöffnungen hineingeschoben und beim Ausbau aus den Schlammdurchtrittsöffnungen nach innen herausgezogen werden. Da durch die erfindungsgemäß angeordneten Ausflußbuchsen in den Schlammdurchtrittsöffnungen der Einlaufkammer jegliche Feststoffansätze in der Einlaufkammer vermieden und besondere Befestigungsmittel für die Ausflußbuchsen entfallen, kommt es auch zu keiner Unwuchtbildung im Betrieb der Zentrifuge.

Gemäß einer weiteren vorteilhaften Ausgestaltung der Erfindung ist die Einlaufkammer mit einem Verschleißeinsatz ausgestattet, deren Innenwand im Querschnitt einen wellenförmigen Verlauf mit Erhöhungen und Vertiefungen aufweist, wobei in den Vertiefungen — in Übereinstimmung mit den Schlammdurchtrittsöffnungen der Einlaufkammer — die Ausflußbuchsen angeordnet sind und alle Innenflächen in der Einlaufkammer mit Gefälle zu den Austrittsöffnungen hin ausgebildet sind. Auf diese Weise wird einerseits die Einlaufkammer vor Verschleiß bewahrt und andererseits eine von innen der Einlaufkammer zu den Schlammdurchtrittsöffnungen nach außen gerichtete, allseitig gleichmäßig verteilte Strömung des Schlammes bewirkt, wodurch Ansatzbildungen in der Einlaufkammer mit Sicherheit vermieden werden.

Zur besseren Verteilung des axial in die Einlaufkammer einströmenden Schlammes in der Einlaufkammer weist in weiterer vorteilhafter Ausgestaltung der Erfindung der Verschleißeinsatz einen Kegelmantelstumpf auf, der in der Stirnwand im zentralen Bereich mit einer nach innen gerichteten domartigen Erhöhung versehen ist.

Weitere Einzelheiten, Merkmale und Vorteile der Erfindung werden anhand von in Zeichnungsfiguren schematisch dargestellten Ausführungsbeispielen näher erläutert.

Es zeigt:

Fig. 1 eine Vollmantel-Schneckenzentrifuge mit Einlaufkammer und Ausflußbuchsen in den Schlammdurchtrittsöffnungen gemäß der Erfindung im Teillängsschnitt;

Fig. 2 die axiale Hineinsicht in die Einlaufkammer mit Verschleißeinsatz im vergrößerten Maßstab gemäß Fig. 1,

Fig. 3 eine aus einem Verbundwerkstoff bestehende Ausflußbuchse gemäß der Erfindung im Längsschnitt.

Bei der in Fig. 1 dargestellten Vollmantel-Schneckenzentrifuge ist der innerhalb des Trommelmantels (1) angeordnete Tragkörper der Förderschnecke (2) als Hohlwelle (3) ausgebildet. In der Hohlwelle (3) ist ein Schlammzuführungsrohr (4) koaxial angeordnet, das in eine Einlaufkammer (5) mündet. Diese Einlaufkammer (5) ist innen mit einem Verschleißeinsatz (6) ausgestattet, der einen Kegelmantelstumpf aufweist, und der in der Stirnwand (7) im zentralen Bereich mit einer nach innen gerichteten, domartigen Erhöhung (8) versehen ist. Die Innenwandkontur des Verschleißeinsatzes (6) weist — wie insbesondere die Fig. 2 zeigt — im Querschnitt einen wellenförmigen Verlauf mit Erhöhungen (9) und Vertiefungen (10) auf.

Im peripheren zylindrischen Bereich der Einlaufkammer (5) sind gleichmäßig über den Umfang verteilt Schlammdurchtrittsöffnungen (11) angeordnet, in die von innen über entsprechende Ausnehmungen (12) im Verschleißeinsatz (6) gemäß der Erfindung verschleißfeste Ausflußbuchsen (13) fest, aber auswechselbar eingesetzt sind. Diese Ausflußbuchsen (13), die sehr vorteilhaft in den Vertiefungen (10) des Verschleißeinsatzes (6), und zwar in Übereinstimmung mit den Schlammdurchtrittsöffnungen (11) angeordnet sind, weisen sehr vorteilhaft einen Flansch (14) auf, der in eine entsprechende Ausnehmung im Verschleißeinsatz (6) eingreift. Auf diese Weise erhält die verschleißfeste Ausflußbuchse (13) durch Festsitz eine ausreichend feste Veranke-

rung im Verschleißeinsatz (6), so daß sie einerseits in jedem Betriebszustand der Zentrifuge ihre Lage beibehält, jedoch andererseits, wenn sie verschlissen ist, wiederum sehr leicht nach innen herausgezogen und durch eine neue Ausflußbuchse ersetzt werden kann. Sowohl die Montage als auch die Demontage dieser erfindungsgemäß ausgebildeten verschleißfesten Ausflußbuchsen (13) wird daher nicht nur erheblich vereinfacht, sondern das Auswechseln dieser Ausflußbuchsen (13) kann auch, da keine besonderen Befestigungselemente erforderlich sind, mit verhältnismäßig geringem Arbeits-, Zeit- und Kostenaufwand durchgeführt werden.

Ferner kann — wie Fig. 3 zeigt — die verschleißfeste Ausflußbuchse (15) gegebenenfalls auch sehr vorteilhaft aus einem Verbundwerkstoff, insbesondere aus Kunststoff und/oder Gummi mit Metallkern (16) bestehen. Der Metallkern (16) dient hierbei sehr vorteilhaft zur Stabilisierung der Ausflußbuchse (15), während der als Verschleißschutz dienende Kunststoff und/oder Gummi, der den Metallkern (16) umgibt, auch sehr vorteilhaft eine spaltfreie lückenlose Abdichtung gegenüber dem Verschleißeinsatz (6) ermöglicht. Im übrigen wird dadurch, daß die Einlaufkammer (5) innen mit einem Verschleißeinsatz ausgestattet ist, der im Querschnitt einen wellenförmigen Verlauf mit Erhöhungen (9) und Vertiefungen (10) aufweist, wobei an der tiefsten Stelle der Vertiefungen die Ausflußbuchsen angeordnet sind, mit Sicherheit vermieden, daß es in der Einlaufkammer zu Feststoffansätzen und den damit verbundenen Unwuchtbildungen kommt, da durch diese erfindungsgemäße Ausbildung des Verschleißeinsatzes (6) der über das Schlammzuführungsrohr (4) in Pfeilrichtung (17) in die Einlaufkammer einfließende Schlamm darin allseitig gleichmäßig verteilt und über ein zu den Ausflußbuchsen führendes Gefälle von wenigstens 15° durch die Öffnungen der Ausflußbuchsen (13) nach außen in die Zentrifugentrommel störungsfrei ausgetragen wird.

Patentansprüche

1. Zentrifuge, insbesondere Vollmantel-Schneckenzentrifuge mit axialem Schlammzuführungsrohr, das in eine mit Schlammdurchtrittsöffnungen und Verschleißeinsatz versehene Einlaufkammer der Zentrifuge mündet, dadurch gekennzeichnet, daß die Schlammdurchtritts-Öffnungen (11) der Einlaufkammer (5) mit verschleißfesten Ausflußbuchsen (13, 15) versehen sind, die von innen in die Schlammdurchtrittsöffnungen (11) der Einlaufkammer (5) fest, aber auswechselbar eingesetzt sind.

2. Zentrifuge nach Anspruch 1, dadurch gekennzeichnet, daß die Einlaufkammer (5) innen mit einem Verschleißeinsatz (6) ausgestattet ist, deren Innenwandung im Querschnitt einen wellenförmigen Verlauf mit Erhöhungen (9) und Vertiefungen (10) aufweist, wobei in den Vertiefungen (10) — in Übereinstimmung mit den Schlammdurchtrittsöffnungen (11) der Einlaufkammer (5) — die Ausflußbuchsen (13, 15) angeordnet sind.

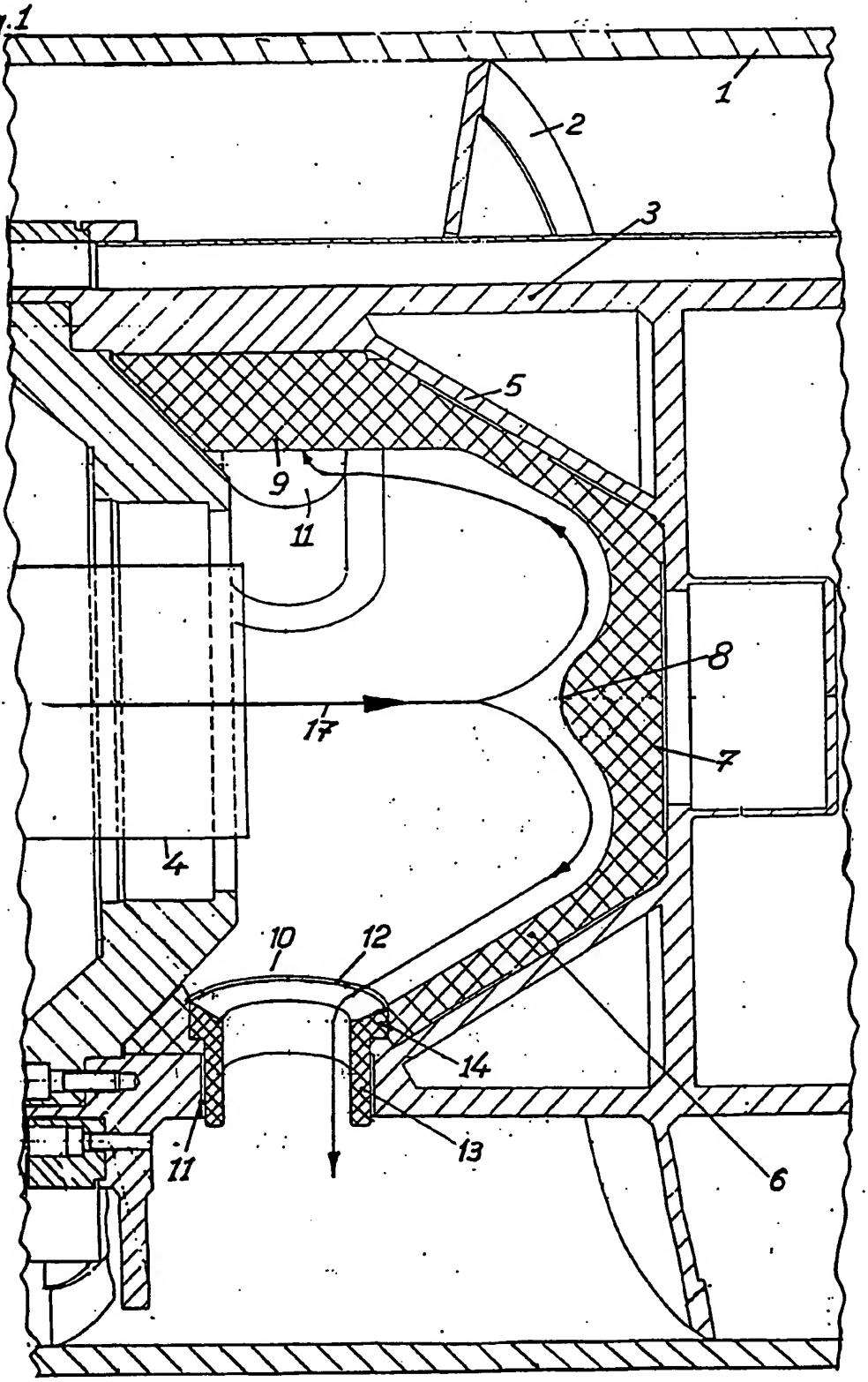
3. Zentrifuge nach Anspruch 2, dadurch gekennzeichnet, daß der Verschleißeinsatz (6) einen Kegelmantelstumpf aufweist, der in der Stirnwand (7) im zentralen Bereich mit einer nach innen gerichteten, domartigen Erhöhung (8) versehen ist.

4. Zentrifuge nach Anspruch 1, 2 oder 3, dadurch gekennzeichnet, daß die verschleißfesten Ausflußbuchsen (15) aus einem Verbundwerkstoff, insbesondere aus Kunststoff und/oder Gummi mit Metallkern (16) bestehen.

Hierzu 3 Seite(n) Zeichnungen

Nummer: DE 40 41 868 A1
Int. Cl.[5]: B 04 B 1/20
Offenlegungstag: 2. Juli 1992

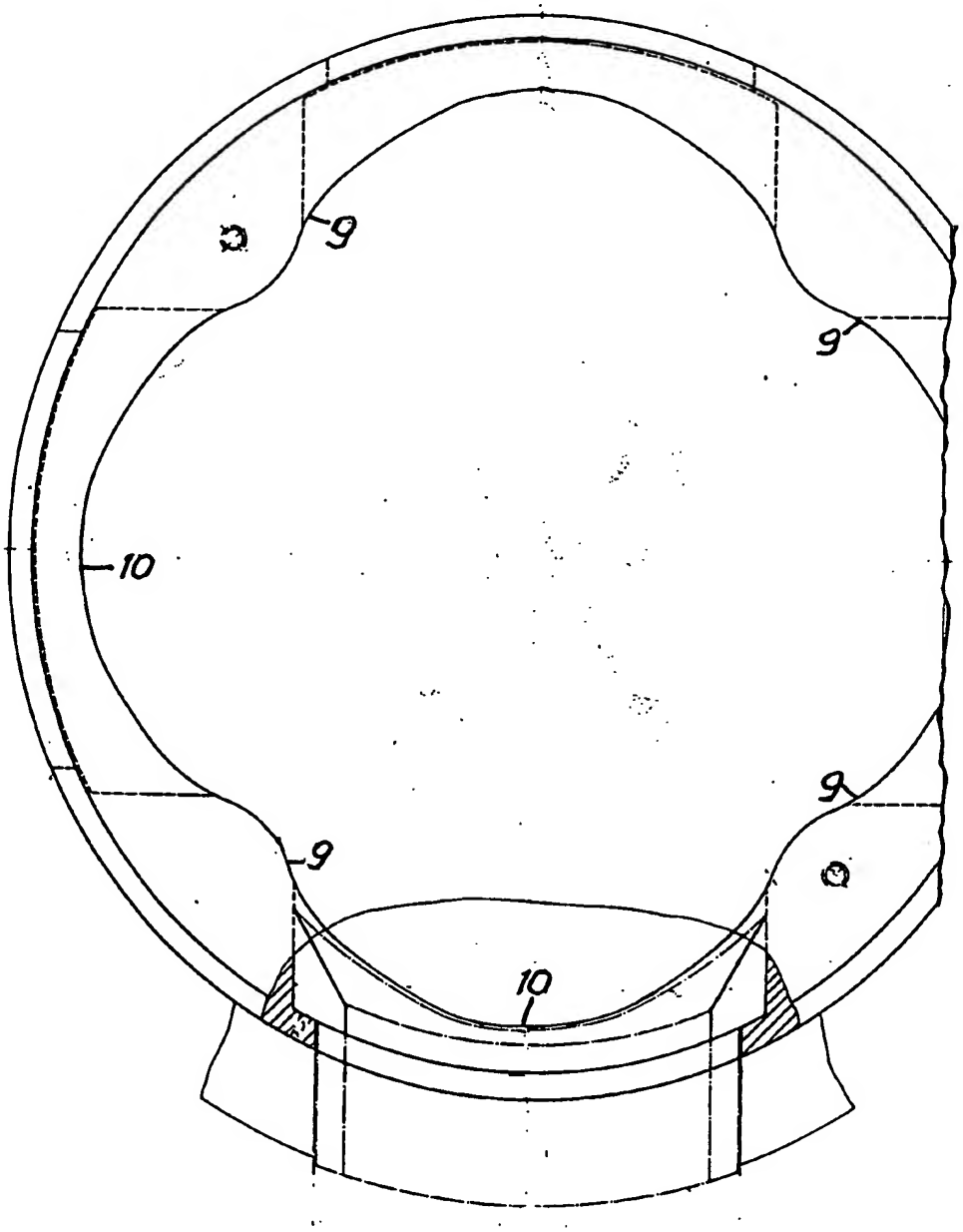
Fig.1



208 027/252

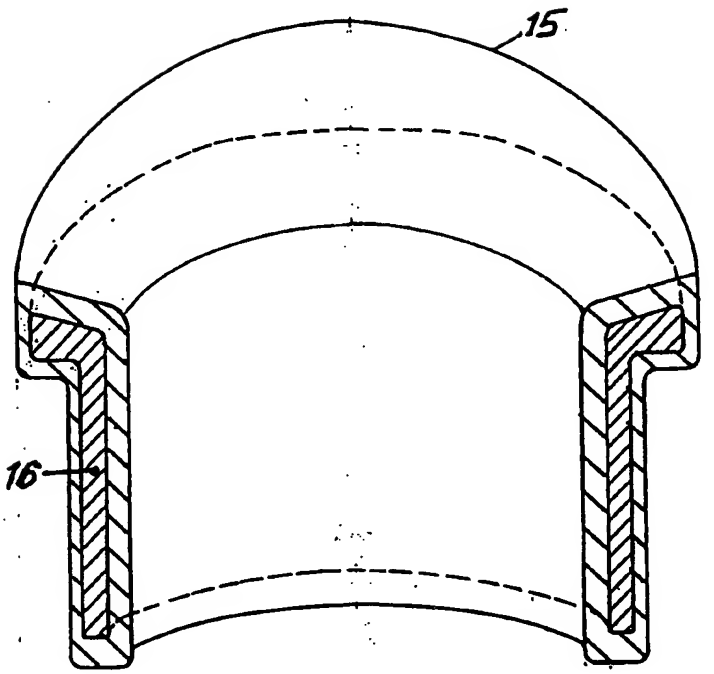
Nummer: DE 40 41 868 A1
Int. Cl.[5]: B 04 B 1/20
Offenlegungstag: 2. Juli 1992

Fig.2



Nummer: DE 40 41 868 A1
Int. Cl.[5]: B 04 B 1/20
Offenlegungstag: 2. Juli 1992

Fig. 3



PUB-NO: DE004041868A1

DOCUMENT-IDENTIFIER: DE 4041868 A1

TITLE: Auger-type slurry centrifuge - has interchangeable **wear** resistant bushes inserted in slurry ports from inside inlet chamber

PUBN-DATE: July 2, 1992

INVENTOR-INFORMATION:

NAME	COUNTRY
VIERTEL, RUDOLF	DE
FELDKAMP, BERNWARD	DE

ASSIGNEE-INFORMATION:

NAME	COUNTRY
KLOECKNER HUMBOLDT DEUTZ AG	DE

APPL-NO: DE04041868

APPL-DATE: December 27, 1990

PRIORITY-DATA: DE04041868A (December 27, 1990)

INT-CL (IPC): B04 B 001/20 , B04 B 007/12

EUR-CL (EPC): **B04B001/20** , B04B007/12

US-CL-CURRENT: 494/53

ABSTRACT:

The centrifuge, particularly of the auger type with solid casing, has an axial slurry-feed pipe delivering into an inlet chamber with slurry ports and a **wearing** insert. The ports (11) in the chamber (5) contain **wear**-resistant bushes (13), fixed in position from inside the chamber, but which are interchangeable. The chamber **wearing** insert (6) can be of undulating cross-section with protrusions (9) and recesses (10), the latter accommodating the bushes in line with the ports. ADVANTAGE - Easy installation and dismantling.

(19)日本国特許庁（ＪＰ）　(12)公開特許公報（A）　(11)特許出願公開番号
特開平11－267549
(43)公開日　平成11年(1999)10月5日

(51)Int.Cl.[6]	識別記号	ＦＩ
Ｂ０４Ｂ　11/02		Ｂ０４Ｂ　11/02

審査請求　有　　請求項の数4　ＯＬ　（全 3 頁）

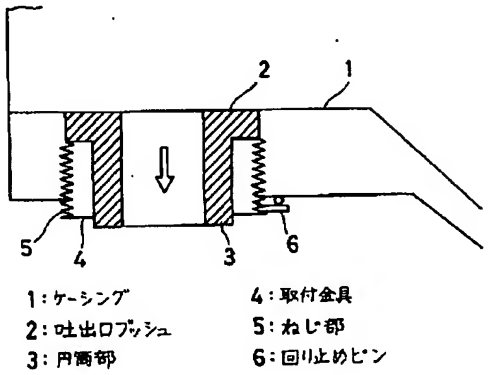
(21)出願番号　特願平10－74103

(22)出願日　平成10年(1998)３月23日

(71)出願人　595109878
オーツケミカル株式会社
大阪府高石市取石４丁目８番25号
(72)発明者　田端　航二
大阪府高石市取石４丁目８番25号　オーツケミカル株式会社内
(72)発明者　中村　誠司
大阪府高石市取石４丁目８番25号　オーツケミカル株式会社内
(74)代理人　弁理士　丹羽　宏之　（外１名）

(54)【発明の名称】　吐出口ブッシュ及び遠心分離機

(57)【要約】
【課題】　遠心分離機に装着される吐出口ブッシュの交換を容易且つ短時間で行えるようにする。
【解決手段】　吐出口ブッシュ２のセラミックや超硬合金類あるいはウレタンエラストマー等の耐摩耗性材料の円筒部３の側部に、外周囲にねじ部５を有した取付金具４を一体的に設ける。そして、この吐出口ブッシュ２を遠心分離機のケーシング１に設けた貫通孔にケーシング１の外側から螺合結合させ、回り止めピン６を取り付ける。



1

【特許請求の範囲】
【請求項1】　遠心分離機のケーシングに取り付けられる吐出口ブッシュであって、円筒部の側部に、外周囲にねじ部を有した取付部材を一体的に設けて、ケーシングの外側から該ケーシングに螺合取付可能に形成したことを特徴とする吐出口ブッシュ。
【請求項2】　取付部材の回転止め手段を設けたことを特徴とする請求項1記載の吐出口ブッシュ。
【請求項3】　ケーシングに吐出口ブッシュが取り付けられる遠心分離機であって、前記吐出口ブッシュは、円筒部の側部に外周囲にねじ部を有した取付部材を一体的に設けて、ケーシングの外側から該ケーシングに螺合取付可能に形成したことを特徴とする遠心分離機。
【請求項4】　吐出口ブッシュの回転止め手段を設けたことを特徴とする請求項3記載の遠心分離機。
【発明の詳細な説明】
【0001】
【発明の属する技術分野】本発明は、スラリーや固形流動物などの吐出口に設けられる吐出口ブッシュ及びこの吐出口ブッシュが取り付けられる遠心分離機に関するものである。
【0002】
【従来の技術】遠心分離機は、一般的には固液間の比重差を利用して遠心力を与えることにより固液分離を行うもので、通常横軸型のドラムを高速回転させたときに円周部に集まる固形物をスクリューで連続的に吐出ブッシュを通して外部に排出するような構成となっている。この固形物はスラリー等を含む固形流動物であり、吐出口ブッシュには耐摩耗性の高い材質のものが使用されている。
【0003】従来、このような遠心分離機の吐出口に摩耗防止用リングとして装着される吐出口ブッシュは、通常円筒状の形状となっており、ケーシングの内側から該ケーシングに設けられた貫通穴に嵌合されて取り付けられる。そして、ブッシュ本体のフランジ部分でケーシングの外側に抜けないように固定されている。
【0004】
【発明が解決しようとする課題】従来の吐出口ブッシュは、上記のように遠心分離機のケーシングの内側から挿入して取り付けるので、交換作業が容易でなく、また時間がかかり、メンテナンス費用を含めるとコスト高になってしまうという問題点があった。
【0005】本発明は、上記のような問題点に着目してなされたもので、交換作業が容易且つ短時間で済み、メンテナンスコストの低減が可能な吐出口ブッシュ及びこれを有した遠心分離機を提供することを目的としている。
【0006】
【課題を解決するための手段】本発明に係る吐出口ブッシュ及び遠心分離機は、次のように構成したものである。

2

【0007】（1）遠心分離機のケーシングに取り付けられる吐出口ブッシュであって、円筒部の側部に、外周囲にねじ部を有した取付部材を一体的に設けて、ケーシングの外側から該ケーシングに螺合取付可能に形成した。
【0008】（2）上記（1）の構成において、取付部材の回転止め手段を設けた。
【0009】（3）ケーシングに吐出口ブッシュが取り付けられる遠心分離機であって、前記吐出口ブッシュは、円筒部の側部に外周囲にねじ部を有した取付部材を一体的に設けて、ケーシングの外側から該ケーシングに螺合取付可能に形成した。
【0010】（4）上記（3）の構成において、吐出口ブッシュの回転止め手段を設けた。
【0011】
【発明の実施の形態】図1は本発明に係る遠心分離機用吐出口ブッシュの構成を示す断面図であり、遠心分離機のケーシングに取り付けた状態を示している。
【0012】同図において、1は遠心分離機の外胴やスクリューを収容した内胴である金属製のケーシングで、例えばステンレスにより形成されている。2はケーシング1に設けた貫通孔に装着された吐出口ブッシュで、フランジの付いた円筒状の、セラミック，超硬合金類やウレタンエラストマーなどの耐摩耗性材料からなる円筒部3と、この円筒部3の側部に一体的に設けられた取付金具（取付部材）4とで構成され、取付金具4の外周囲には上記ケーシング1の貫通孔の内壁のねじ部と螺合結合するためのねじ部5が設けられている。6は吐出口ブッシュ2の回転を防止するための回り止めピン（回転止め手段）で、ケーシング1に点溶接されている。
【0013】上記のように構成された遠心分離機の吐出口ブッシュ2は、その内部を図1の矢印方向にスラリーや固形流動物等が流れるため、耐摩耗性などの点で優れた材料を用いている。しかし、ある程度使用すると交換の必要が生じてくる。その際、本実施例の吐出ブッシュ2はケーシング1に螺合取付可能であり、ケーシング1の外側から取り付け及び取り外しができるので、遠心分離機の内部を分解することなく交換作業を行うことができる。
【0014】したがって、吐出口ブッシュ2の交換作業が容易且つ短時間でできて、コストダウンが可能となる。また吐出口ブッシュ2には回り止めピン6が設けられているので、振動等で回転してケーシング1から外れることもなく、信頼性の高いものとなっている。
【0015】図2は遠心分離機における吐出口ブッシュ2の装着部の一例を示したものである。同図中、11は外胴（ボウル）で、内部にスクリューが配設されており、このスクリューを有したドラムの回転によってスラリーや固形流動物等が図の右方向に運ばれて吐出口ブッ

シュ2から外部に排出されるようになっている。12は摩耗防止用のリングである。

【0016】

【発明の効果】以上のように、本発明によれば、吐出口ブッシュの交換作業が容易且つ短時間で済むようになり、メンテナンスコストの低減が可能になるという効果がある。

【図面の簡単な説明】

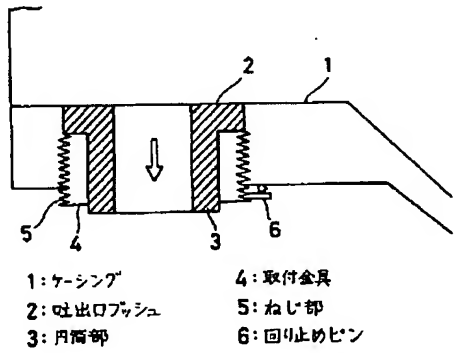
【図1】　本発明に係る吐出口ブッシュの構成を示す断面図

【図2】　吐出口ブッシュの装着部の一例を示す説明図

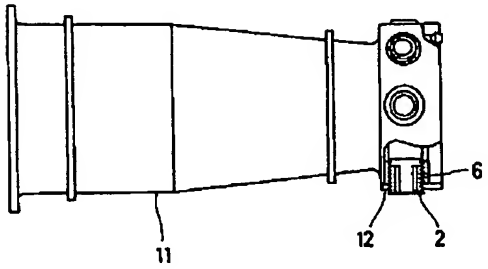
【符号の説明】

1　ケーシング
2　吐出口ブッシュ
3　円筒部
4　取付金具
5　ねじ部
6　回り止めピン

【図1】



【図2】



PAT-NO: JP411267549A

DOCUMENT-IDENTIFIER: **JP 11267549 A**

TITLE: BUSH FOR DISCHARGE OUTLET, AND CENTRIFUGAL SEPARATOR

PUBN-DATE: October 5, 1999

INVENTOR-INFORMATION:

NAME	COUNTRY
TABATA, KOJI	N/A
NAKAMURA, SEIJI	N/A

ASSIGNEE-INFORMATION:

NAME	COUNTRY
OOTSU CHEMICAL KK	N/A

APPL-NO: JP10074103

APPL-DATE: March 23, 1998

INT-CL (IPC): B04 B 011/02

ABSTRACT:

PROBLEM TO BE SOLVED: To easily exchange, in a short time, a bush for a discharge outlet mounted on a centrifugal separator.

SOLUTION: A fitting met at 4 with a **screw** part 5 on its outer periphery is integrally provided on the side part of a cylinder part 3 of a **wear**-resistant material such as ceramics, carbide alloys or urethane elastomers of a bush 2 for discharge outlet. In addition, this bush 2 for discharge outlet is bonded by screwing into a through-hole provided on a casing 1 of a centrifugal separator from the outside of the casing 1 and a rotation stop pin 6 is fitted.

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
18 September 2003 (18.09.2003)

PCT

(10) International Publication Number
WO 03/076078 A1

(51) International Patent Classification[7]: B04B 1/20

(21) International Application Number: PCT/DK03/00168

(22) International Filing Date: 14 March 2003 (14.03.2003)

(25) Filing Language: Danish

(26) Publication Language: English

(30) Priority Data:
PA 2002 00398 14 March 2002 (14.03.2002) DK

(71) Applicant *(for all designated States except US)*: **ALFA LAVAL COPENHAGEN A/S** [DK/DK]; Manskinvej 5, DK-2860 Søborg (DK).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **GRØNNEGAARD, Erland** [DK/DK]; Agerskovvej 24, DK-2610 Rødovre (DK). **HYLDEGAARD, Jacob** [DK/DK]; Thorvaldsensvej 19, DK-1871 Frederiksberg C (DK).

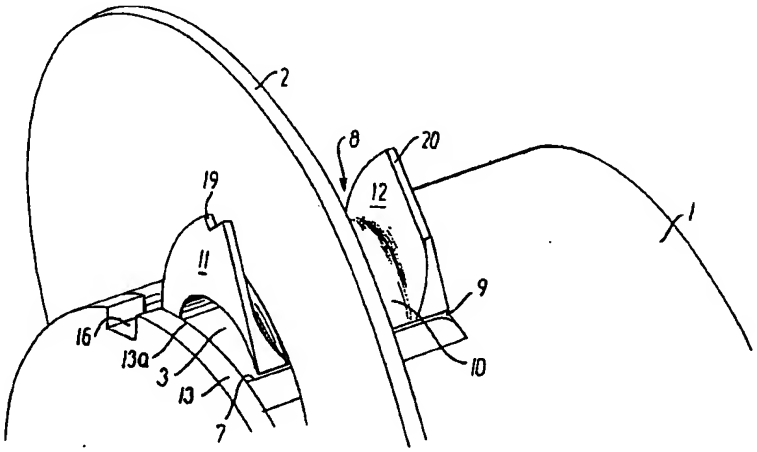
(74) Agents: **JØRGENSEN, Bjørn, Barker** et al.; Internationalt Patent-Bureau A/S, Høje Taastrup Boulevard 23, DK-2630 Taastrup (DK).

(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ (utility model), CZ, DE (utility model), DE, DK (utility model), DK, DM, DZ, EC, EE (utility model), EE, ES, FI (utility model), FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK (utility model), SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE,

[Continued on next page]

(54) Title: DECANTER CENTRIFUGE WITH WEAR REINFORCEMENT INLET



(57) Abstract: A decanter centrifuge has a hollow, rotatable drum with a screw conveyor comprising a core body (1), in which an inlet opening for material into the drum from an inlet chamber (3) is provided, the inlet opening having a delimitation surface (7) which is rear relative to the direction of rotation and extending substantially axially, said delimitation surface being provided with a wear reinforcement member (8). The wear reinforcement member extends along the rear delimitation surface (7) into the inlet chamber (3). The wear reinforcement member (8) is provided with abutment surfaces (11; 19) in abutment against abutment surfaces associated with the core body, which during operation prevents the wear reinforcement member (8) from moving tangentially forwards in the direction of rotation and radially out of the core body (1). At least one of said abutment surfaces associated with the core body (1) is constituted by a removable blocking member (17). The wear reinforcement member (8) and the inlet opening (5) are designed in such a manner that the wear reinforcement member (8) can be introduced to its operating from the exterior side of the core body (1).

WO 03/076078 A1

ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declaration under Rule 4.17:

as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii)) for the following designations AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW, ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)

Published:

— *with international search report*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

DECANTER CENTRIFUGE WITH WEAR REINFORCEMENT INLET

The present invention relates to a decanter centrifuge with a hollow drum having a longitudinal axis of rotation and a direction of rotation, a screw conveyor in the drum comprising a core body carrying at least one helical winding, wherein an inlet chamber is provided in the core body, said inlet chamber having an inlet opening for inlet of material into the drum from the inlet chamber, a central inlet being provided in the inlet chamber as well as an end wall in the inlet chamber opposite the central inlet, the inlet opening having a delimitation surface, which is rear relative to the direction of rotation and extending substantially axially, said delimitation surface being provided with a wear reinforcement, and a preferably substantially tangentially extending edge, which is distal relative to the central inlet.

The rear delimitation surface may be rounded in such a manner that its foremost point is positioned radially within the envelope surface of the surface of the core body,

Preferably, two or more inlet openings are provided.

The invention further relates to a wear reinforcement member for such a decanter centrifuge.

DE-A-40 41 868 discloses a centrifuge with a core body assembled from several parts bolted together, which makes it possible to disassemble them and give access to the interior of the inlet chamber. The inlets from the inlet chamber into the drum are lined with wear bushings, which have a collar such

that they are secured against the centrifugal force, but have to be replaced from the inside.

It is furthermore known to use wear reinforcement members, which are welded onto the core body. It is very work demanding to exchange such wear reinforcement members, and weldable materials are generally not very wear-resistant, for which reason such wear reinforcement members have to be replaced often.

The object of the invention is to provide a decanter centrifuge having a wear reinforcement member, which is easy to exchange and which only lays down a few restrictions for the choice of material.

This object is according to the invention met in that the wear reinforcement comprises a wear reinforcement member extending along the rear delimitation surface and, when viewed in section transverse to the direction of the axis of rotation, extending around the rear delimitation surface, the wear reinforcement member extending so far into the inlet chamber along its wall that a concave back surface of the wear reinforcement member facing the rear delimitation surface has an interior portion in the inlet chamber, said portion being positioned behind the foremost point of the rear delimitation surface viewed relative to the direction of rotation, that the wear reinforcement member is provided with an abutment surface with a component facing tangentially opposite the back surface in abutment against an abutment surface associated with the core body and which during operation prevents the wear reinforcement member from moving tangentially forwards in the direction of rotation, and an abutment surface with a radially outwards facing component in abutment

against an abutment surface associated with the core body preventing the wear reinforcement member from moving radially out of the core body, that at least one of said abutment surfaces associated with the core body is constituted by a removable blocking member and that the wear reinforcement member and the inlet opening are designed in such a manner that the wear reinforcement member can be introduced to its operating position from the exterior side of the core body.

In this manner an easy replacement is obtained as it may take place from the outside, and no special demands are made to the securing of the wear reinforcement member, which is kept in place by the blocking member and other engaging surfaces.

In a preferred embodiment the wear reinforcement member comprises at least one end portion extending along an end wall of the inlet chamber, said end wall extending from the distal edge. In this manner this end wall is protected too.

With a view to its securing and to additional wear protection the wear reinforcement member comprises a second end portion at the opposite end relative to the first end portion, said second end portion extending along a proximal wall in the inlet chamber, the wear reinforcement member extending between the end wall and the proximal wall. Preferably, at least one end portion is accommodated in a recess in the adjacent wall. In this way substantially smooth end wall surfaces are obtained in the inlet chamber, and the abutment surface for preventing tangential movement may be constituted of an area in the recess or recesses, when said recesses are designed

in correspondence with the end portions.

Preferably, a deeper recess accommodating the blocking member is provided in the wall at the end of said recess opposite said rear delimitation surface. The blocking member is preferably not tightened against the wear reinforcement member. In this manner it becomes possible to use a comparatively brittle material for the wear reinforcement member.

Preferably, a filling material for filling out irregularities is provided between the wear reinforcement member and the rear delimitation surface. Hereby, a well-defined supporting surface for the wear reinforcement member is ensured. The filling material may comprise epoxy or the like.

The wear reinforcement member is preferably made from a not weldable material, as a more wear-resistant material can be used without increase of the costs. In particular, the wear reinforcement member may comprise tungsten carbide, which is precisely a comparatively brittle, but very wear-resistant material and not weldable. However, the invention is not confined to the use of any definite material, and other materials suited for wear reinforcement may be used.

In a preferred embodiment the helical winding extends across an inlet into the drum and a recess is provided in the helical winding at the inlet to allow replacement of the wear reinforcement member. Such an embodiment is in particular of interest, when the inlet has a wider axial extension than more than half of the pitch of the helical winding, which is often desirable to prevent the inlet from the inlet chamber to the drum from delimiting the total inlet capacity.

The object is further met by a wear reinforcement member for a decanter centrifuge, said member having the shape of a saddle.

The invention will now be described in detail in the following by means of an example of an embodiment with reference to the schematic drawings, in which

Fig. 1 illustrates a screw conveyor of a decanter centrifuge with certain parts cut away,

Fig. 2 a sectional view along the line II-II in Fig. 1,

Fig. 3 a view corresponding to a part of Fig. 2, but of an embodiment of the invention,

Fig. 4 a partially perspective view of the embodiment according to Fig. 3 with parts cut away to show a blocking member, and

Fig. 5 a second partially perspective view of the embodiment according to Fig. 3.

Figs 1 and 2 show a screw conveyor known per se of a decanter centrifuge. The screw conveyor comprises a core body 1 carrying a helical winding 2. For the sake of clarity, the helical winding has in Fig. 1 been cut away on the side facing the viewer.

An inlet chamber 3 is provided in the core body 1, into which chamber a central inlet tube 4 extends, and inlet openings 5 are provided, through which material to be centrifuged may flow from the inlet chamber 3 into a drum (not shown) surrounding the screw conveyor.

During operation the screw conveyor will together with the drum rotate as indicated by an arrow 6 in Fig. 2.

During operation material to be centrifuged

will flow through the inlet tube 4 into the inlet chamber 3 and out through the inlet openings 5, the material flowing on account of the rotation across the rear, when seen in the direction of rotation, delimitation surfaces 7 of the inlet openings, which in the embodiment are rounded. The material flowing in is accelerated by the delimitation surfaces 7, which results in a considerable wear of these surfaces 7, which it is consequently desirable to protect.

Figs 3-5 show in greater detail the area around an inlet opening 5, where the delimitation surface 7 is provided with a wear reinforcement member 8 according to the present invention. The inlet chamber 3 is defined at one end by proximal wall 9 provided with a central hole. At the other end the inlet chamber 3 is defined by an end wall 13.

The wear reinforcement member 8 generally has the shape of a saddle, the member comprising a cylinder-shaped body part 10 with end portions or flanges 11, 12 at the ends.

In the example, the wear reinforcement member 8 is made from tungsten carbide. It is not weldable, but is kept in place by its geometric design and its consequent engagement with the delimitation surface 7 and other surfaces, as will be explained in detail in the following.

The end wall 13 is defined by a distal edge 13a in the inlet opening 5. In the end wall 13 and in the proximal wall 9 recesses are provided for accommodating the flanges 11 and 12, such that the sides of these flanges facing one another substantially are in alignment with or slightly lowered relative to the adjacent surfaces of the end wall 13 and the proximal

wall 9, respectively. In this manner is ensured that no edges protrude into the flow of material to be centrifuged.

A dovetail-shaped, axial groove 16 is provided in the end wall 13 and in the proximal wall 9 for accommodating a blocking member 17 to prevent the wear reinforcement member 8 from falling out. The blocking member 17 is kept in place by a screw 18 in the respective wall. The blocking members 17 are not tightened against the wear reinforcement member 8.

A recess 19 is provided in the flange 11 for accommodating the blocking member 17. The recess has a first abutment surface 19a with a tangentially facing component 19b and a second abutment surface 19c with a radially outwards facing component 19d.

Moreover, the flange 11 has a curved abutment surface 11a with a tangentially directed component 11b.

The flange 12 has a chamfered abutment surface 20, which in the operating position extends under the blocking member and which extends in the same plane as the abutment surface 19c.

The wear reinforcement member 8 extends so far into the inlet chamber 3 along its wall that an interior portion 14 of the back wall of the wear reinforcement member 8 facing the delimitation surface 7 is situated behind the foremost point 15 of the delimitation surface 7 seen relative to the direction of rotation 6.

The wear reinforcement member 8 is accommodated between the end wall 13 and the proximal wall 9, whereby it is kept in place in axial direction.

In tangential direction the wear reinforcement

member 8 is kept in place by its abutment against the delimitation surface 2 and the abutment of the abutment surfaces 11a and/or 19a against wall in the recess in the end wall 13 (and correspondingly in the proximal wall 9) and against the blocking member 17, respectively. It should be noted that only one of the abutment surfaces 11 and 19a need to be present to attain the tangential securing of the wear reinforcement member 8.

In radial direction the wear reinforcement member 8 is kept in place against the centrifugal force by the engagement of the interior portion 14 with the delimitation surface 7 and the abutment of the abutment surfaces 19c and 20 against the blocking members 17.

In the direction towards the centre of the core body 1 the securing is less important, as the centrifugal force acts outwardly. However, it should be noted that the wear reinforcement member is prevented from falling into the inlet chamber 3 by its engagement with the exterior part of the delimitation surface 7, the engagement of the abutment surface 11a with the recess in the end wall 13 and/or the engagement of the on account of the dovetail-shape tilted abutment surface 19a with the blocking member 17.

Between the delimitation surface 7 and the body part 10 of the wear reinforcement member 8 a material has preferably been introduced for filling out the cavities, which might otherwise be present on account of the production tolerances. This material may for instance be epoxy or silicone. In this manner a well defined supporting surface for the wear reinforcement member is obtained.

A part of the helical winding 2 extends across the inlet 5, and in this part a recess 21 is provided. On account of this recess and the design of the wear reinforcement member 8 for that matter, it becomes possible to replace the wear reinforcement member from the exterior side of the core body 1, when this has been removed from the drum: The screws 18 are removed, the blocking members 17 are then pulled out axially from the dovetail-shaped groove 16, following which the wear reinforcement member 8 may be raised as indicated in Fig. 5. Then the wear reinforcement member 8 may be turned to be released from the helical winding 2 and a new wear reinforcement member 8 may be introduced by following the same operations in reverse order.

PATENT CLAIMS

1. A decanter centrifuge with a hollow drum having a longitudinal axis of rotation and a direction of rotation (6), a screw conveyor in the drum comprising a core body (1) carrying at least one helical winding (2), wherein an inlet chamber (3) is provided in the core body (1), said inlet chamber having an inlet opening (5) for inlet of material into the drum from the inlet chamber (3), a central inlet (4) being provided in the inlet chamber (3) as well as an end wall (13) in the inlet chamber (3) opposite the central inlet (4), the inlet opening (5) having a delimitation surface (7), which is rear relative to the direction of rotation and extending substantially axially, said delimitation surface being provided with a wear reinforcement (8), and a preferably substantially tangentially extending edge (13a), which is distal relative to the central inlet (4), characterized in that the wear reinforcement comprises a wear reinforcement member (8) extending along the rear delimitation surface (7) and, when viewed in section transverse to the direction of the axis of rotation (6), extending around the rear delimitation surface (7), the wear reinforcement member (8) extending so far into the inlet chamber (3) along its wall that a concave back surface of the wear reinforcement member (8) facing the rear delimitation surface (7) has an interior portion (14) in the inlet chamber, said portion being positioned behind the foremost point (15) of the rear delimitation surface (7) viewed relative to the direction of rotation (6), that the wear reinforcement member (8) is provided with an abutment surface (11a;

19a) with a component (11b; 19b) facing tangentially opposite the back surface in abutment against an abutment surface associated with the core body (1) and which during operation prevents the wear reinforcement member (8) from moving tangentially forwards in the direction of rotation (6), and an abutment surface (19c) with a radially outwards facing component (19d) in abutment against an abutment surface associated with the core body (1) preventing the wear reinforcement member (8) from moving radially out of the core body (1), that at least one of said abutment surfaces associated with the core body (1) is constituted by a removable blocking member (17) and that the wear reinforcement member (8) and the inlet opening (5) are designed in such a manner that the wear reinforcement member (8) can be introduced to its operating position from the exterior side of the core body (1).

2. A decanter centrifuge according to claim 1, c h a r a c t e r i z e d in that the blocking member (17) protrudes from the end wall (13) beyond a part of the wear reinforcement member (8).

3. A decanter centrifuge according to claim 1 or 2, c h a r a c t e r i z e d in that the wear reinforcement member (8) comprises at least one end portion (11) extending along an end wall (13) of the inlet chamber (3), said end wall extending from the distal edge (13a).

4. A decanter centrifuge according to claim 3, c h a r a c t e r i z e d in that the wear reinforcement member (8) comprises a second end portion (12) at the opposite end relative to the first end portion (11), said second end portion (12) extending

along a proximal wall (9) in the inlet chamber (3), the wear reinforcement member (8) extending between the end wall (13) and the proximal wall (9).

5. A decanter centrifuge according to claim 3 or 4, c h a r a c t e r i z e d in that at least one end portion (11, 12) is accommodated in a recess in the adjacent wall (13, 9).

6. A decanter centrifuge according to claim 5, c h a r a c t e r i z e d in that in the wall (9, 13) at the end of said recess opposite said rear delimitation surface (7) a deeper recess (16) accommodating the blocking member (17) is provided.

7. A decanter centrifuge according to claims 1-6, c h a r a c t e r i z e d in that between the wear reinforcement member (9) and the rear delimitation surface (7) a filling material for filling out irregularities is provided.

8. A decanter centrifuge according to claim 7, c h a r a c t e r i z e d in that the filling material comprises epoxy.

9. A decanter centrifuge according to claim 18, c h a r a c t e r i z e d in that the wear reinforcement member (8) is made from a not weldable material.

10. A decanter centrifuge according to claim 9, c h a r a c t e r i z e d in that the wear reinforcement member (8) comprises tungsten carbide.

11. A decanter centrifuge according to claims 1-10, c h a r a c t e r i z e d in that the helical winding (2) extends across an inlet (5) into the drum and that a recess (21) is provided in the helical winding (2) at the inlet (5) to allow replacement of the wear member (8).

12. A wear member for a decanter centrifuge according to claims 1-11, c h a r a c t e r i z e d in having the shape of a saddle.

5

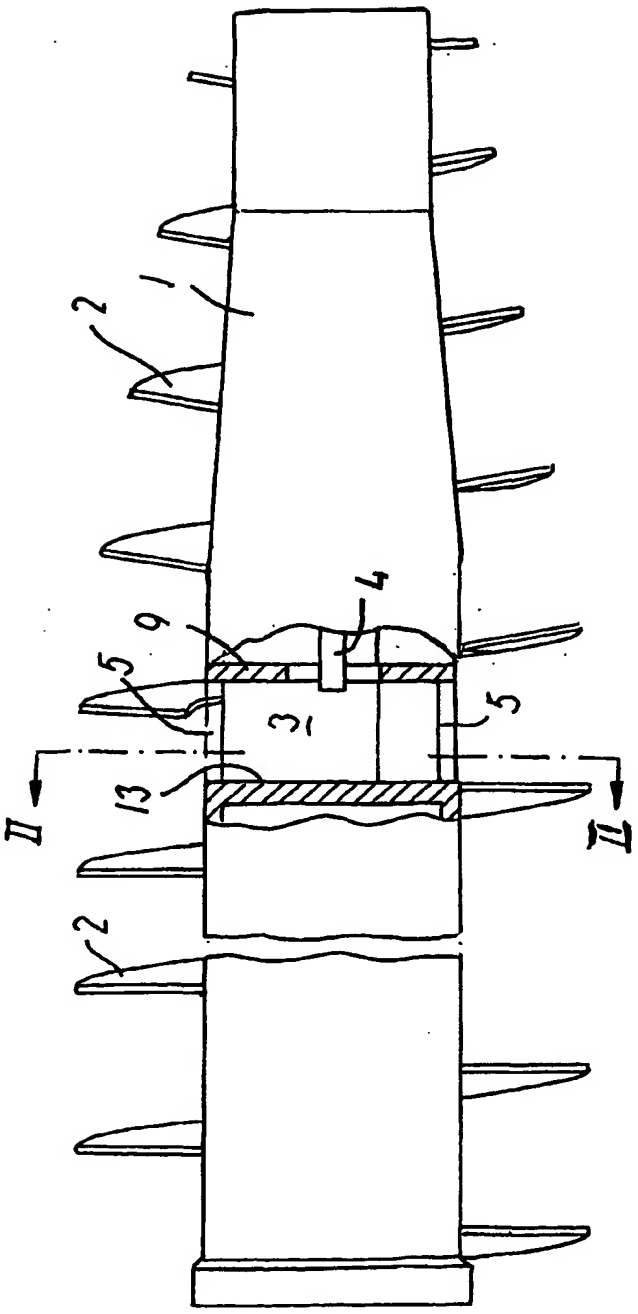


FIG.1

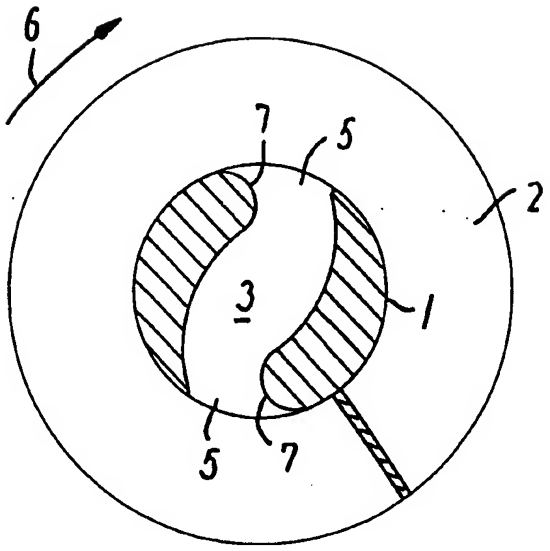


FIG.2

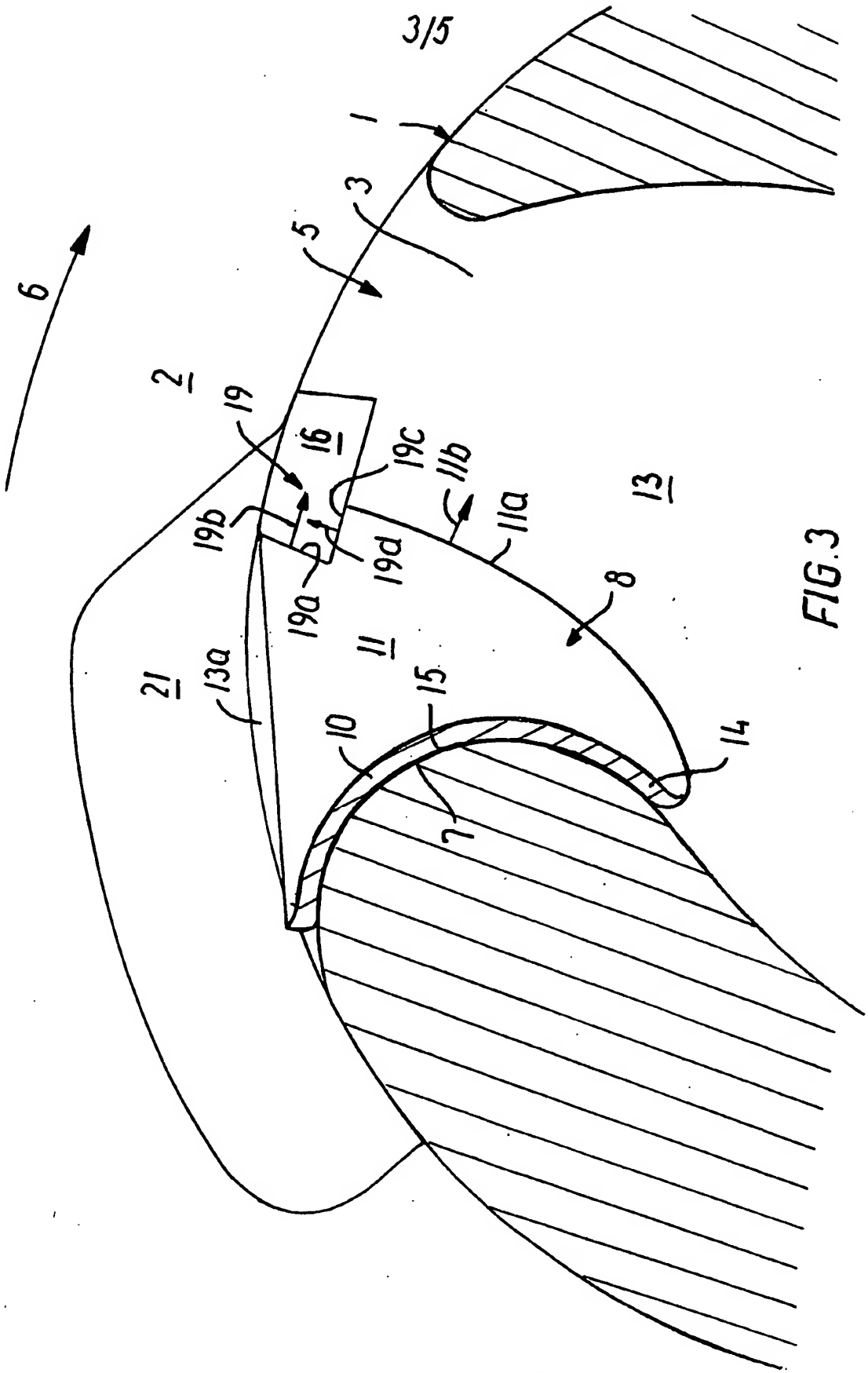


FIG.3

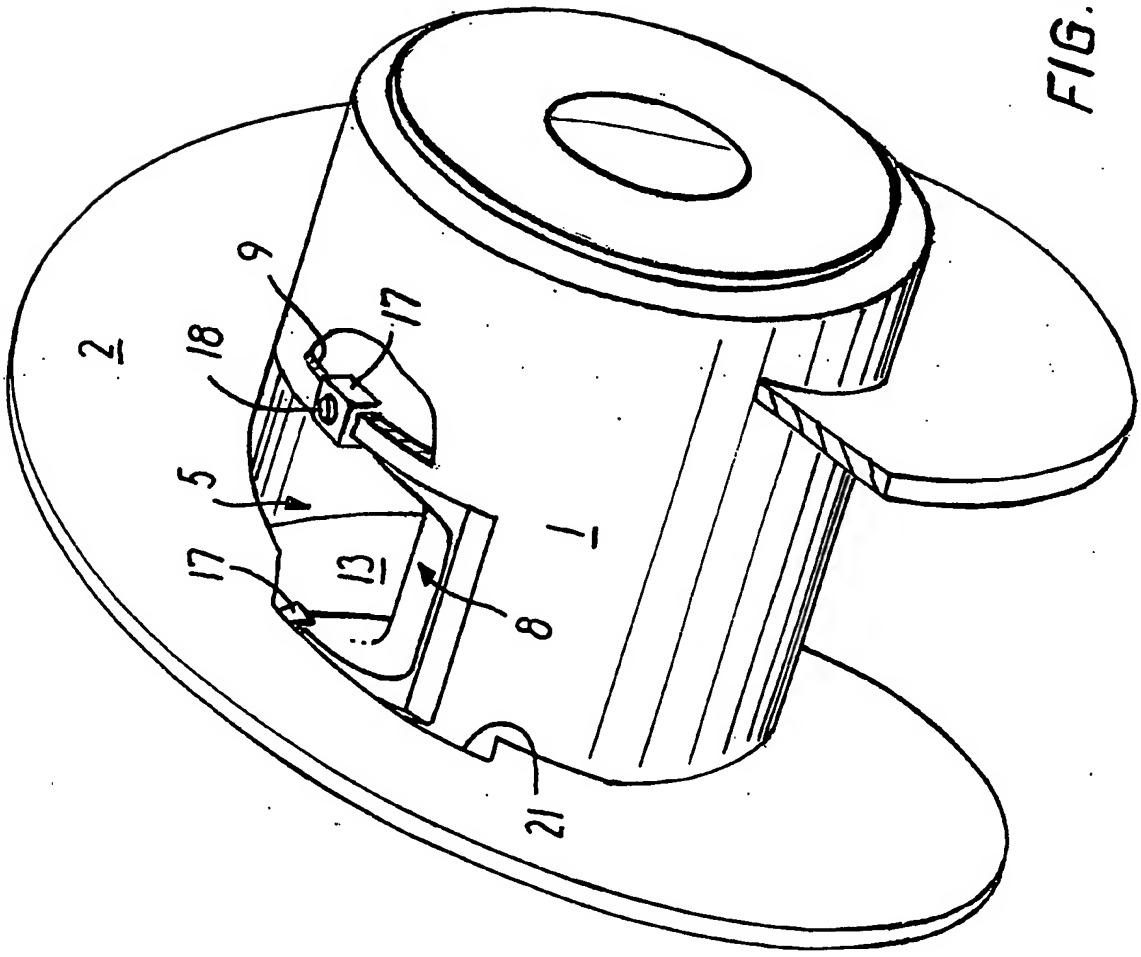


FIG. 4

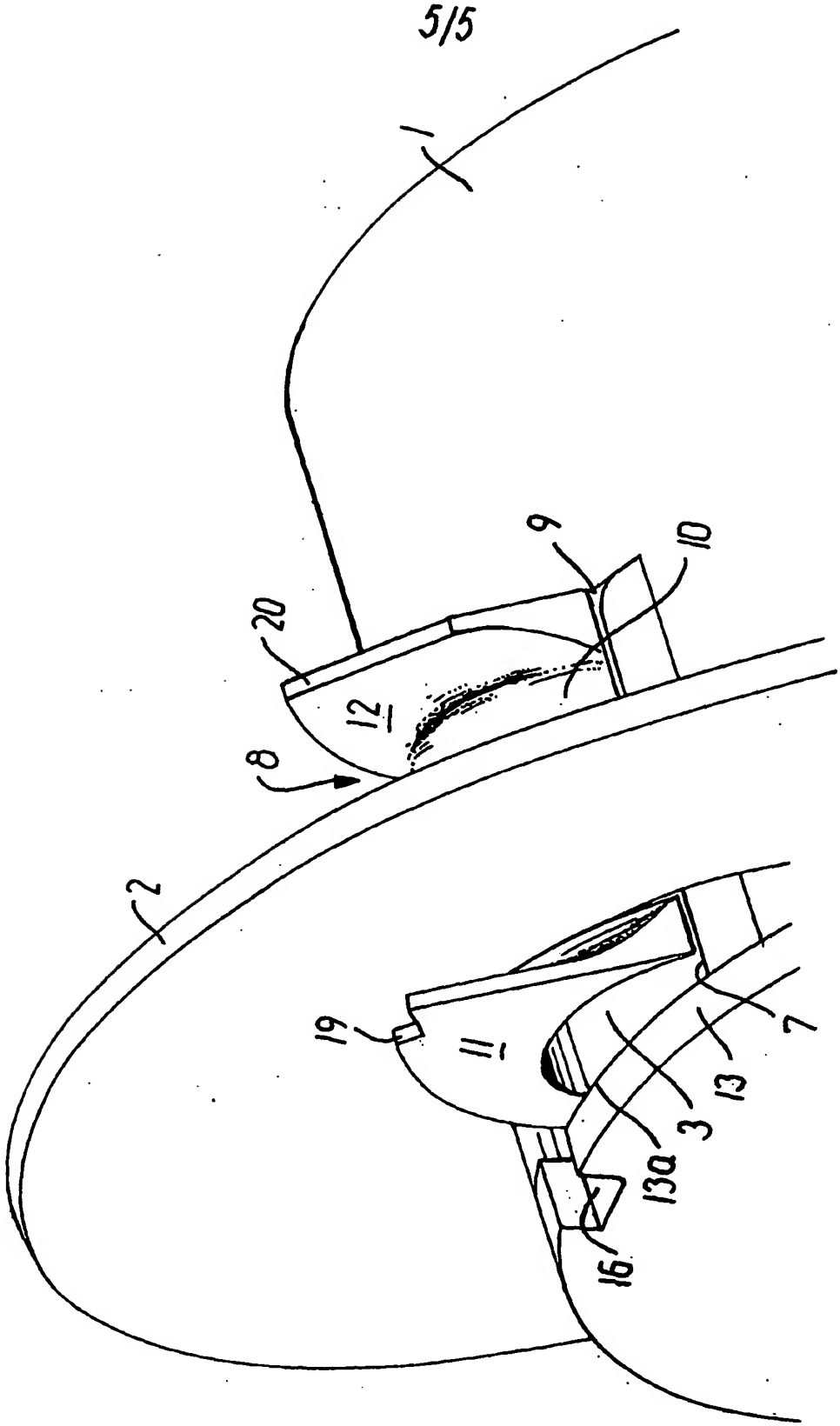


FIG.5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/DK 03/00168

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: B04B 1/20
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: B04B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI, EPO-INTERNAL, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 4041868 A1 (KLÖCKNER-HUMBOLDT-DEUTZ AG), 2 July 1992 (02.07.92), figures 1-3, claims 1-4, abstract --	1-12
A	DE 1815199 A (PENNSALT CHEMICALS CORP.), 24 July 1969 (24.07.69), page 8, line 12 - page 9, line 4, figure 3 --	1-12
A	DE 3723864 A1 (WESTFALIA SEPARATOR AG), 26 January 1989 (26.01.89), figures 1-3, abstract -- --------	1-12

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
27 May 2003	06 -06- 2003
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Ulf Nyström/MP Telephone No. +46 8 782 25 00

Form PCT/ISA/210 (second sheet) (July 1998)

INTERNATIONAL SEARCH REPORT

Information on patent family members

29/04/03

International application No.
PCT/DK 03/00168

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 4041868 A1	02/07/92	NONE	
DE 1815199 A	24/07/69	FR 1596076 A	15/06/70
		GB 1190179 A	29/04/70
		US 3428246 A	18/02/69
DE 3723864 A1	26/01/89	NONE	

P.O. BOX 1450
ALEXANDRIA, VA 22313-1450
IF UNDELIVERABLE RETURN IN TEN DAYS

OFFICIAL BUSINESS

02 1A $02.07⁰
0004204479 FEB 01 2007
MAILED FROM ZIPCODE 22314

AN EQUAL OPPORTUNITY EMPLOYER